DOCUMENT RESUME

ED 311 402 CS 009 791

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TITLE The Effects of Computer-Assisted Instruction on Reading Achievement for College Freshman.
PUB DATE 4 May 89
NOTE 20p.; Paper presented at the Annual Meeting of the International Reading Association (34th, New Orleans, LA, April 30-May 4, 1989).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Analysis of Covariance; *College Freshmen; Comparative Analysis; *Computer Assisted Instruction; Higher Education; *Reading Achievement; Reading Centers; *Reading Instruction; Reading Programs; Reading Research; Remedial Reading
IDENTIFIERS Nelson Denny Reading Tests

ABSTRACT

A study examined whether there was any difference in student achievement if students used computer-assisted instruction or traditional reading lab activities. Subjects, 42 students enrolled in 1988 in a 5-week summer early enrollment program, were placed in a reading improvement class based on performance on the Nelson-Denny Reading Test. Subjects in the experimental group spent 45 minutes per day using computer-assisted instructional materials while the control group spent the first 45 minutes engaging in individualized reading lab activities. Both groups were given the same type of instruction for the last half of each class. Data from classes taught the previous year by the same instructor were used to compare students' performance. Posttest results indicated that the computer group did as well as the comparison groups on the Nelson Denny tests and that they did somewhat better on the vocabulary subtest than the control group. Results also indicate that computer usage had a positive effect on students' attitudes towards computer-assisted instruction. (Four tables of data are included and 44 references are attached.) (RS)

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THE EFFECTS OF COMPUTER-ASSISTED INSTRUCTION ON READING ACHIEVEMENT FOR COLLEGE FRESHMEN

PRESENTED TO

THE COLLEGE READING SPECIAL INTEREST GROUP
OF THE
INTERNATIONAL READING ASSOCIATION

MAY 4, 1989
NEW ORLEANS, LOUISANA

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THE EFFECTS OF COMPUTER-ASSISTED INSTRUCTION ON READING ACHIEVEMENT FOR COLLEGE FRESHMEN

Since the advent of the Information Age, microcomputers have been viewed as a tool to enhance the quality of education. Computers are being used for instruction in many ways; students are learning about computers and they are learning from computers. Some of the critical questions that might be asked are: Do computers aid the learning process? Are computers motivational devices that encourage students to attack learning with enthusiasm? Do students recognize the capabilities of the microcomputer and accept it as a tool for improving reading?

As early as the 1960's, computers were used to teach beginning reading. The Stanford Project (Atkinson and Hansen) focused on drill and practice and showed favorable results. Spache (1967) questioned the almost exclusive use of decoding without physical or emotional associations and the isolation of learning. Lack of available computers and cost contributed to prohibit computer instruction from becoming widespread.

In the late 1970's microcomputers emerged as compact, relatively moveable units that were attractively priced. Many educational institutions quickly acquired these for classroom use. Much of the software emphasized drill and practice routines--an expensive workbook type (Geoffrion and Geoffrion) of instruction--but

with immediate feedback which was often very positive and motivating.

Computer-assisted instruction (CAI) refers to computer generated activities for the purpose of learning. These activities may be drill and practice or they may be tutorial. According to Patterson and Gregory, "The future of college learning centers will be closely tied to the future of computers in education." A survey of computer use in developmental programs in colleges revealed that a number of institutions had been using computers for one to five years, with one and one-half years being the average length (McDonald, 1984). McDonald also reported that CAI is at least as effective as traditional reading instruction and may improve attitudes toward reading. When used with adult non-readers, GED students gained an average of one entire year in less than twelve hours of computer-assisted instruction. Patterson and Gregory state that CAI offers the advantages of being patient with slow students, interesting, fun, and different. They also assert that with CAI the same results can be achieved in less time than traditional instruction. They contend one reason for the scarcity of research in CAI is that using computers for instruction holds such promise that educators are hesitant to deprive control groups of this opportunity for instruction.

CAI has been tested in a number of college reading settings. Using a software package entitled Speed Reader II to determine if students made greater gains in efficiency by using computer or printed text for reading instruction, Wepner and Feeley (1987) concluded that computers can be used as effectively as traditional approaches for timed readings with comprehension checks. One very positive discovery they made was that students in the experimental setting

responded favorably to this manner of instruction. Only one student in the experimental group of 24 students indicated a negative response to the question concerned with whether he would use the computer for general reading improvement. Likewise, only one student replied negatively to the question of using the computer for reading rate improvement.

To determine if students could improve their vocabulary through computer drills, Taylor and Rosecrans (1986) used a computer vocabulary program called "Kernel" to instruct college students. This use of computer instruction did not facilitate improved scores on the vocabulary portion of the Nelson-Denny Reading Test.

Heinrichs (1988) studied the effects of CAI on reading achievement in college students. Although vocabulary and reading rate did not measure significant gains, reading comprehension increases were at a significant level.

Some educators who have used computers for instruction insist that affective outcomes of CAI are more important than the instructional results (Patterson and Gregory). Freedom from embarrassment or disapproval in a classroom when students make mistakes enhances students' positive attitude toward computers for instruction (Robinson, et al.). In a high school content class, students measured increased self-esteem after using CAI for one semester. Although it was for only one semester, the significant positive effect was encouraging (Robinson et al.). Ingle (1985) also reported positive results when high school students were permitted to attend a non-credit reading lab and use microcomputers for individualized instruction.

Some university instructors have created their own software to address the needs of their students. Mulcahy (1984) devised a vocabulary program using Greek and Latin morphemes for a file of 299 words. Gordon (1984) created a method of getting students to learn all forms of a word (the root word as well as its variations) and made a prototype computer program for use on an IBM computer.

Two obvious needs are apparent from a review of research in the use of CAI for college reading instruction. There is a need for more formal research to determine the effects of computer-assisted instruction on reading achievement--both short-term and long-range effects. There is also a need for software appropriate for college students that is more than drill and practice. With technology constantly being improved, the production of interactive software programs that instruct as well as drill is desireable and feasible.

DESIGN OF THE STUDY

This study was designed to determine whether there was any difference in student achievement if students used computer-assisted instruction or traditional reading lab activities. During the summer of 1988, students enrolled in the Summer Early Enrollment Program took a reading class. All students were given the Nelson-Denny Reading Test and students who made a total score of 13.0 grade equivalent or better were placed in EDRD 250--College Reading. Those who scored below 13.0 were placed in EDRD 150--Reading Improvement. Two classes of EDRD 150 taught by the same instructor were used for this experimental study.

A class taught at 8:00 was the computer (experimental) group and a class at 10:00 was the reading lab (control) group. Classes met five days a week for five weeks. Each class period was one hundred minutes long, excluding a ten minute break in the middle of the class. The experimental group worked for the first forty-five minutes each day on computers using The Secondary Reading Efficiency Program by Weaver Instructional Systems. The software was designated for grade levels six through fourteen. Each level had pretests and posttests for lessons in both vocabulary and comprehension.

Instruction in the control group consisted of individualized reading lab activities during the first forty-five minutes of class. These included: controlled reader lessons, timed readings, Jamestown Advanced Level Comprehension Lessons, Bergen Evans Vocabulary Development tapes, Rapid Vocabulary Development tapes and manuals, Reader's Theater, Reader's Digest "It Pays to Increase Your Word Power" activities, current magazines, and other readings.

During the last half of the class, both groups had the same type of instruction which included: reading sample chapters from college text books, reading newspapers, Directed Reading-Thinking Activities, completing two library assignments which required reading newspapers on microfilm and current periodicals, writing in a journal, reading two foreign films, reading a novel, and reading several short stories. For vocabulary study, Feinstein's Programed College Vocabulary, 3600 was used as a text. The words from this book were often reinforced with a game in class. There were 21 students in each group.

On the basis of their Nelson-Denny Reading Test scores, students in the

experimental group were placed in appropriate computer levels for both comprehension and vocabulary. Each student had a separate student disk which recorded what lessons the student had completed and his scores for each lesson. This information could be read on the computer by the instructor or it could be printed out for the instructor's record. Because disks were set up for each student, the student only needed to log on to the computer with his disk and then proceed as directed by the computer after selecting either a comprehension or vocabulary lesson.

Students were directed to take notes on computer instruction in both vocabulary and comprehension passages. They were directed to work on both vocabulary and comprehension lessons each day. Comprehension lessons took much less time than vocabulary lessons. In the vocabulary lessons, the words were first given with the definition, then the words were given in a multiple-choice quiz format. Finally, students supplied the words in sentences to demonstrate proper usage of words they just learned. Students completed an average of 24 vocabulary lessons (ranging from 6 to 34) and they completed an average of 55 comprehension lessons (ranging from 29 to 88). The computer group spent a total of 11 hours and 55 minutes on CAI.

Data from classes taught by the same instructor during the summer of 1987 were also compared to the experimental group.

RESULTS OF STATISTICAL ANALYSIS

Table I shows pretest and posttest grade equivalent means, standard deviations, and gains on the Nelson Denny Test for the computer group and the two comparison groups (the lab group in 1988 and 1987 summer classes). The reader should note the significant differences in pretest scores.

An analysis of covariance was done to determine if there were significant differences between the posttest means of the computer group and the two comparison groups. Table II shows that the only significant differences were in the area of vocabulary. These differences favored the computer group.

Table III shows that when a similar analysis of covariance was done, using raw scores instead of grade equivalents, no differences at the .05 level of significance were found.

The assessment of the pre-program and post-program attitudes of the computer group yielded the data shown in Table IV. Students apparently had positive attitudes about using computers at the start of the summer session and attitudes of those who doubted computer effectiveness at the beginning improved, especially in the area of vocabulary.

Correlations between the many variables involved in this study were computed. An analysis of significant correlations follows:

1) Among the most powerful correlations were significant negative findings

Table I

Nelson-Denny Mean Grade Equivalents and Gains

	Pre-test		Post-test		Mean	
Computer Group '88 (N=21)						
	Mean	SD	Mean	SD	Gain	SD
Vocab	11.8	1.4	13.0	1.3	1.2	1.6
Comp	10.8	1.7	11.6	1.8	.7	2.4
Total	11.4	.9	12.4	1.0	1.0	1.6
Lab Group '88 (N=21)						
	Mean	SD	Mean	SD	Gain	SD
Vocab	11.7	1.0	11.9	1.8	.2	1.4
Comp	12.1	1.2	12.1	1.8	.0	2.3
Total	12.0	.8	12.1	1.5	.1	1.5
Summer Group '87 (N=55)						
	Mean	SD	Mean	SD	Gain	SD
Vocab	10.9	2.2	12.2	2.0	1.4	1.6
Comp	10.2	2.5	11.1	2.6	0.9	2.6
Total	10.5	2.3	11.7	1.8	1.2	1.7

Table II

Analysis of Covariance
(Pretests as Covariates)
Computer Group with:

Lab Group '88
(N=21)

	F	Probability	Significance
Vocab	5.49	.02	Sig.
Comp	.57	.45	N.S.
Total	.57	.46	N.S.

Summer Group '87
(N=55)

	F	Probability	Significance
Vocab	3.42	.04	Sig.
Comp	.31	.73	N.S.
Total	1.08	.34	N.S.

Table III

Analysis of Covariance
Using Raw Scores of
Computer Group

with Lab Group '88
(N=21)

	F	Significance	
Vocab	3.576	.066	N.S.
Comp	33.398	.403	N.S.
Total	25.125	.664	N.S.

with Summer Group '87
(N=55)

	F	Significance	
Vocab	2.188	.118	N.S.
Comp	.679	.510	N.S.
Total	1.058	.351	N.S.

Table IV

Attitudes Toward Use of Computer to Teach Vocabulary and Comprehension (Computer Group) (N=21)

	Pre-Program	Post-Program
Vocabulary		
Positive	14	18
Negative	3	1
Not Sure	4	2
Comprehension		
Positive	15	16
Negative	4	3
Not Sure	2	2

between pretest grade equivalent scores and gains. This reflects regression effects.

2) People with negative pre-program attitudes toward using computers to improve vocabulary completed more vocabulary lessons on the computer than did those with positive attitudes, and negative attitudes improved.

3) There was a significant correlation between the scores students attained on vocabulary or comprehension computer lessons and the number of lessons completed. Students did more lessons in the area (vocabulary or comprehension) in which they were attaining the highest scores.

SAMPLE OF STUDENT RESPONSES

Students were asked to identify any strengths of the computer program and to indicate what they liked most about the computer lessons. The following is a sample of responses from students.

Vocabulary was bad at first and then got better.

Vocabulary helped out because you used the words in different ways.

Vocabulary was challenging.

The computer lessons made you think.

Comprehension lessons and practices were good.

I liked going at my own pace.

It was kind of fun.

You could achieve a higher goal.

Usable words that show up on tests.

Helps reinforce vocabulary book work.

Gave us a new way to learn vocabulary words.

I thought this helped me out a lot in my other classes.

Excellent organization--very useful--but I wish we did this in high school because I'm sure my SAT's would have been higher

Comprehension was more interesting.

When asked to identify any weaknesses of the computer program and what was liked least about the computer lessons, students responded candidly.

Preferred vocabulary because reading puts me to sleep.

Reading needs to have more question for each section.

The computer room was cold.

The way you have to boot it up after each lesson.

Some lessons went over and over and over and over and over.

The program should have been written to work straight through without breaks.

Needed more time.

Spent too much time each day.

CONCLUSIONS

Test scores indicate that the computer group did as well as the comparison groups on the Nelson Denny posttests. There was a tendency for them to do somewhat better on the vocabulary subtest.

Attitudes of students toward the use of computers to improve vocabulary and reading comprehension were generally positive at the beginning of the class, and computer usage had a positive effect on the attitudes of several who were not favorable in the beginning. The program was well received by students.

Those using the Nelson Denny test should expect significant regression

effects in evaluating their programs. That is, students and groups who score low on the pretest will tend to show more gain than those who score high.

As the Secondary Reading Efficiency System was used for this study, it proved to be a worthy part of the instructional program. If the computer instruction had been organized differently--allotting more time or requiring that a certain number of vocabulary and comprehension lessons be completed--the results of the study could have been different. Additional research to investigate computer-assisted instruction in reading for college students is merited.

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